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Headquarters, U.S. Army Medical Command
Fort Sam Houston, Texas
William A. Rice, LTC, MC, USA
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William A. Rice

U.S. Army – Baylor University Graduate Program in Health Care Administration
Headquarters, U.S. Army Medical Command

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Statement of Ethical Conduct in Research

The author declares no conflicts of interest or financial interests in any product or service mentioned in this article, including grants, employment, stock holdings, gifts, or honoraria. The confidentiality of individual members of the study population was protected at all times throughout the study.

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Abstract

Notable variation exists within the U.S. Army Medical Command in the structures and processes used to medically manage injured civilian workers. Likewise, there is great variation in outcome in terms of average total cost per case. In order to establish an evidence base for best practice in the medical management of injured civilian federal employees, structure and process variables for the medical management of injured civilian employees were obtained from an annual status report submitted by each Army medical treatment facility. Using hierarchical multiple linear regression, these variables were tested as potential predictors of the average total cost per case of an injured civilian employee in each medical treatment facility. Three variables were identified as statistically significant predictors that collectively accounted for 79% of the variance observed in the average total cost per case. The presence of an occupational health physician on the local workers' compensation oversight committee is a statistically significant predictor of the average total cost per case, uniquely accounting for nearly one-quarter of the variance seen in the average total cost per case. Management implications, study limitations, and recommendations for future studies are discussed.

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**Unwarranted Variation in the Medical Management of
Injured Civilian Workers in the U.S. Army Medical Command**

In 2003, the federal government paid more than \$2 billion in workers' compensation costs. Additionally, more than 2 million work days were lost due to workplace injuries (Bush, 2004). In the Department of Defense (DOD), workers' compensation costs for fiscal year 2003 totaled over \$627 million (Scanlon, 2003).

Prior to 1960, workers' compensation was paid to injured federal workers by the Department of Labor (DOL). Today, the DOL continues to pay the costs, but federal agencies are now required to reimburse the DOL for workers' compensation costs incurred by their employees. This mechanism is commonly referred to as "charge-back". Building upon this concept, the DOD charges the Department of the Army (DA) for its compensation costs. In turn, DA charges back to its major commands, including its Medical Command (MEDCOM). In this new environment of lower-level charge-back within the context of diminishing resources (fiscal and personnel), MEDCOM has developed a keen interest in managing workers' compensation for its civilian employees.

Concurrent to these developments in federal workers' compensation, an awareness and acceptance of quality shortcomings within the medical industry began to grow. The Institute of Medicine (IOM) explicitly mentioned the need to decrease unwarranted variation in clinical practice as a means to improve quality in American health care systems, stating that "Care should not vary illogically from clinician to clinician or from place to place" (IOM, 2001, p. 8). This concept of reducing unwarranted variation has begun to catch hold within the higher levels of MEDCOM, resulting in the beginnings of a new strategic initiative known as the Unwarranted Variation Initiative (UVI).

Achieving success with the UVI will require a culture change within the MEDCOM. Leaders of the organization must recognize quality shortcomings in the form of unwarranted variation in practice and embrace the organizational desire to correct it. In order to start this culture change, the physician consultants to the Army Surgeon General were summoned to lead it. Each consultant, representing a specific medical specialty, was asked by the Army's Medical Corps Chief to examine their respective specialties for unwarranted variation and opportunities to reduce that variation. In response, the consultant representing occupational and environmental medicine proposed an examination of the variation in the medical management of injured civilian federal employees. From anecdotal experience, it seemed that variation existed in the structure and process of caring for these workers from one medical treatment facility (MTF) to the next. Given such variation in structure and process, it seemed likely that variation existed in the outcomes of these cases. This project was born as a component of the UVI that will focus on the medical management of injured civilian federal employees in the MEDCOM.

The problem to be addressed by this project is as follows. It is likely that there is substantial variation in the structures and processes used to medically manage injured civilian federal employees within the MEDCOM. These variations may be leading to variation in outcomes. These variations in practice may be wasteful and ineffective, resulting in higher-than-necessary wage-loss compensation and medical care costs for MEDCOM's injured civilian employees.

This project is a subset of the UVI. The structures and processes that are currently in place to medically manage injured civilian employees will be examined for variation from one Army MTF to the next. Variation in outcome will also be explored. Specifically, this project

will address whether variation in structure and process measures can predict variation in outcome measures.

History of Workers' Compensation

The Industrial Revolution brought an increase in the number and rate of work-related injuries (Harris, 1994). By the turn of the twentieth century, common law allowed workers to sue their employers for lost wages, medical costs, and lost earning potential due to injuries that were due to negligence on the part of the employer. However, in the process of proving employer negligence, employers often invoked the concept of contributory negligence in which any negligence on the part of the employee would negate the basis for the lawsuit (Harris, 1994). Another popular defense used by employers was the assumption-of-risk doctrine, arguing that (a) employees knew about and assumed the risks of the job when they agreed to employment, (b) that certain high-risk jobs carried higher remuneration, and (c) that the employee was sufficiently compensated through that mechanism. Finally, the employer could invoke the fellow servant doctrine if the employer could demonstrate that a fellow employee was in any way responsible for the accident; this effectively shifted liability to the fellow employee (Nordlund, 1991). In addition to the burden of overcoming these legal defenses, the cost of litigation was usually too high for injured employees who were no longer earning wages due to their injury (Harris, 1994). However, this apparent advantage for employers was occasionally negated by the rare loss in court in which very large damages were awarded to the injured employee, effectively bankrupting the employer.

Employees needed a sure mechanism in which to receive compensation for lost wages and coverage for the cost of medical care and rehabilitation due to workplace illnesses and injuries. Conversely, employers needed a mechanism in which to avoid major catastrophic costs

(Ashford, 1992). Gradually, state legislators enacted workers' compensation laws constructed as a compromise between these two competing interests.

... a series of "no fault" workers' compensation laws were passed on a state-by-state basis. Workers' compensation laws represented a compromise or "lesser peril" for both employers and employees. These laws were supposed to ensure rapid payment to injured workers for lost wages and medical costs regardless of fault. In exchange, employers' liability for occupational injuries, illness, and death was limited if they participated in a compensation system. Under this system, employers generally were exempt from damage suits, unless gross negligence could be proved . . . (Harris, 1994, pp. 567-568).

In 1911, workers' compensation laws were passed in nine states to cover for workplace injuries. Today, all fifty states have statutes for workers' compensation (Harris, 1994).

Evolution of the Federal Employees Compensation Act (FECA)

FECA, currently administered by the Department of Labor's (DOL) Office of Workers' Compensation Program (OWCP), is the workers' compensation program for federal employees (other than uniformed service members). It is based upon the Federal Employees Compensation Act of 1916 and its subsequent amendments. To better understand its current provisions and processes, one must understand the evolution of workers' compensation in the federal sector.

The first workers' compensation program for federal employees was enacted in 1882. It was narrowly focused, covering only those who worked in the agencies that had a life-saving mission (e.g., the Coast Guard). This program was enacted since it was felt that these employees worked in the most hazardous conditions (Nordlund, 1991).

Over time, legislators came to realize that a worker's compensation program had to be universal, rather than focusing on the most hazardous jobs. An injury or death to a worker was

devastating to that worker and his dependents, regardless of whether the duty was considered to be high-risk. The trade-off, however, was cost. By limiting the program to the hazardous trades, costs of the program could be better contained. The Act of 1908 was a compromise that expanded coverage to other hazardous trades within the federal government, but fell short of universal coverage. It is the Act of 1908 that expanded coverage to include artisans and laborers in federal manufacturing establishments, arsenals, and Navy yards. The Act of 1908 covered about one-fourth of the federal workforce. It provided compensation for traumatic injury only. Beneficiaries received their full salary for up to one year, with an additional year of compensation at a reduced rate. There was an initial 15-day waiting period after the injury; if the worker's disability extended beyond 15 days, compensation was awarded retroactively. Each federal agency paid for the program through its appropriations (Nordlund, 1991).

The Act of 1908 was fraught with deficiencies that became apparent over time. First, it was not universal coverage; only about one-fourth of the federal workforce was covered. Second, the 15-day waiting period potentially encouraged workers to malinger in the latter stages of recovery to ensure that they would receive retroactive compensation to the day of injury. Third, the program did nothing to prevent workplace injuries. These deficiencies set the stage for the Act of 1916 that would survive to the present day (Nordlund, 1991).

Other issues entered into the debate leading to the Act of 1916. Much of the argument centered on costs. First, the Act of 1908 provided compensation for traumatic injury only. But many in Congress feared that costs would quickly escalate if the program included a provision for occupational diseases. Second, the Act of 1908 provided the disabled worker with only one or two years of compensation. Doing away with a maximum limit to compensation would not

only escalate costs, but it would deprive Congress of the ability to quickly estimate the upper limit of monetary liability (Nordlund, 1991).

After years of debate, the Act of 1916 was passed by overwhelming majority in both houses of Congress. The major provisions of the FECA of 1916 included: "compensation for all civil employees of the Federal Government injured or killed in the performance of duty; compensation of 66-2/3 percent of monthly pay . . . ; compensation for both traumatic injuries and occupational diseases; . . . a 3-day waiting period; the provision of medical services to injured workers; and a compensation fund supported by congressional appropriations" (Nordlund, 1991, p. 7).

In 1949, amendments were made to the FECA of 1916. The amendments included provisions that continue to the present day, such as schedule award benefits (providing compensation for specified periods for permanent disability of specified parts or functions of the body), personal attendants, and vocational rehabilitation. But three problems still remained after the 1949 amendments. First, delays in claims adjudication caused difficulties for injured workers to maintain personal income flows. Second, the objectivity of medical appraisals came into question since the FECA required exclusive use of federal or federally designated physicians and federal medical facilities (Nordlund, 1991). Third, there was no mechanism to encourage workplace injury and illness prevention programs. Future amendments would address these concerns.

A 1960 amendment to the FECA of 1916 established "a charge-back program in which Federal agencies are required to absorb, through the budget process, the direct cost of accidents, injuries, and deaths" (Nordlund, 1991, p. 11). The charge-back system placed responsibility for workplace safety and health directly upon the agencies, thus giving an incentive to prevent

workplace injuries and illnesses. In 1974, an amendment was approved that established a 45-day continuation-of-pay period, in which the employee would continue to be paid full salary for the first 45 days after injury (Nordlund, 1991). By the end of the 45-day period, the employee must establish proof of disability and file a claim for further compensation at a tax-free rate of 66-2/3 percent of monthly pay (United States Department of Labor, 1999). The 1974 amendment also included the free-choice-of-physician provision (Nordlund, 1991). Federal employees were no longer required to exclusively use federal or federally-designated physicians and medical facilities.

The 1974 amendment is significant for putting hurdles in the way of administrators attempting to control costs and federal health care providers trying to manage the care of injured or ill employees. Willis Nordlund describes the potential problems associated with the 1974 amendment as follows.

The General Accounting Office had serious problems with this scheme. It argued that, because injured employees remained in a full-pay status from the first day of injury, there would be no incentive to remain at work, even when the injury was minor. Combined with the free-choice-of-physician provision – also provided by the 1974 amendments – this consideration established a process in which a medical evaluation that was necessary to prevent abuse was essentially precluded. In other words, if the employee's physician found the employee disabled due to the injury, the agency had little recourse but to provide continuation of pay. If a second medical opinion was needed, by the time it was scheduled and conducted, the employee was usually back to work. (p. 11)

Subsequent to the 1974 amendment, the number of traumatic lost-time injury claims dramatically increased (Table 1). The first full year after the 1974 amendment, in 1976, the

number of claims increased nearly seven-fold from 1974, the last full year prior to implementation of the 1974 amendment. In 1981, the Reagan Administration attempted to eliminate the continuation-of-pay provision and to provide more involvement of the agencies in the adjudication process. However, these initiatives were thwarted by strong union opposition (Nordlund, 1991).

Medical Management of Injured Employees

Within the Context of the Federal Employees Compensation Act

Characteristics of the FECA that are directly relevant to the medical management of injured civilian federal employees are described in Table 2. These distinct features include free choice of physician, pre-authorized referrals to other physicians from the treating physician, no direct employer contact with the treating physician, no “clinic-first” policies that require injured employees to report to the agency’s medical facility prior to seeking care from the physician of their choice, continuation of pay (COP), a fee schedule for medical services that reflects reasonable and customary fees for the services involved, and a charge-back system that makes the agencies fiscally liable for the cost of the program for their respective injured employees. Each of these features directly impacts the medical management of the injured employees.

Prior to discussing the medical management of the civilian federal employee, the process that occurs at the local level must be understood. Figures 1 and 2 outline the process flow for an uncomplicated injured worker. When an injury occurs, Form CA-1 (Federal Employee's Notice of Traumatic Injury and Claim for Continuation of Pay/Compensation) is submitted at the supervisory level. If there is lost work time after the date of the injury, COP is initiated. If medical care is needed, then a Form CA-16 (Authorization for Examination and/or Treatment) is used to authorize medical care at government expense. At this point, the employee chooses

whether to seek care at the local MTF or the private sector. If the employee chooses to seek treatment in the private sector, communication between the employing agency and the treating physician is limited to written communication only. If the employee does not return to work in 45 days, then a Form CA-7 (Claim for Compensation on Account of Traumatic Injury or Occupational Disease) is submitted to OWCP. At this point, COP stops and wage compensation paid through DOL begins.

The main goals of medical management of injured civilian federal employees are two-fold and benefit both the employer and the injured employee. Medical management must ensure that high-quality health care is provided. It must also ensure that injured workers are returned to productive employment as soon as possible (ICF Consulting, 2004). Early return-to-work enhances the probability that a worker will remain productive and healthy (Mets, 1994). Without violating these two goals, program costs must be contained. In traditional health care, managed care techniques have been used to contain health care costs while maintaining quality. However, workers' compensation is one of the last fee-for-service health delivery systems. As such, it has often been the victim of cost-shifting and up-coding of conditions from health care providers who are aware that most workers' compensation laws allow for greater levels of health care utilization and reimbursement (Swedlow & Johnson, 2001).

Managed care cost containment techniques have included utilization management (such as preauthorization for care), primary care gatekeepers, risk-sharing with medical providers of care, and risk-sharing with patients through the imposition of co-payments and deductibles (Swedlow & Johnson, 2001). However, the use of these techniques within the context of workers' compensation has barriers that are not encountered in typical healthcare settings. In workers' compensation (including FECA), patients with work-related injuries or illnesses have a

mandatory benefit that covers all necessary medical expenses. By definition, then, no co-payment or deductible can be imposed upon workers who are exercising their right to medical care under workers' compensation. In addition, twenty-eight states and FECA allow the initial selection of a treating physician by the employee (United States Department of Labor, 2003), thus allowing direct access to specialists or other less-desirable health care providers, from a fiscal or quality perspective.

Since workers' compensation also includes indemnity costs through wage replacement, employers yearn to decrease the number of lost work days in addition to cost containment for medical care. Not only does the employer want to decrease the cost of paying wages to workers who are not on the job, they also want to decrease time away from work in order to regain the productivity that the healed, healthy, and experienced worker provides to the firm. Managed care techniques have the potential to contain medical costs and lost workdays.

To be effective, cost control must be based upon a cardinal principle of managed care, namely that both the unit price of care and the volume of services be controlled (Swedlow & Johnson, 2001). In states where the employer has control over the choice of physician used by the injured employee, cost containment efforts have included preferred provider organization (PPO) discounts and bill audits, in which physician fees are adjusted against state-mandated fee schedules. Utilization controls, on the other hand, have included pre-authorization for hospital, surgical, and diagnostic services. Special emphasis has also been placed upon high-volume, specialized providers such as chiropractors and physical therapists (Swedlow & Johnson, 2001).

The indemnity portion of workers' compensation, i.e. wage replacement, is a concern to employers since it represents nearly half of all workers' compensation costs (Swedlow & Johnson, 2001). The American College of Occupational and Environmental Medicine

(ACOEM) has developed occupational medicine practice guidelines that include expected lengths of disability (ACOEM, 2003). By using physicians who are trained in occupational medicine, injured workers can be treated by physicians who are knowledgeable about their workplace hazards and are able to prescribe rehabilitation and return-to-work programs that are tailored to the specific requirements of the patient and employer (Rhodes, 1998; Swedlow & Johnson, 2001). In one setting that uses an “occupational medicine” model (i.e., active involvement of occupational medicine physicians, use of ACOEM’s practice guidelines and expected lengths of disability, active communication with employers to explore possible modified duties for injured workers, and other avenues of case management), there has been a 21% lower medical cost per injury over a traditional fee-for-service model. The largest cost differences were demonstrated in outpatient surgery and ancillary services such as pharmacy, x-ray, and physical therapy. Indemnity costs were also significantly lower in the managed care group (Cheadle et al., 1999). Another study revealed higher employer satisfaction with the occupational medicine model. Employers were particularly satisfied with the quality and frequency of communication with the treating physicians regarding return to work and work modification issues for their recovering worker-patients (Kyes, Wickizer, & Franklin, 2003). Legal hurdles (e.g., no clinic-first policy, no direct communication with the treating physician, and free-choice-of-physician) limit the DOD’s ability to optimally execute an occupational medicine model.

Disability management within FECA has paralleled some of the techniques used in the private sector. Case management of claims began in 1984. In 1992, the OWCP formalized the use of nurses as case managers through a concept called Quality Case Management (ICF Consulting, 2004). Elements of Quality Case Management (QCM) include:

1. Early notification to claimants that compensation payments will not continue indefinitely, and that they are expected to return to work.
2. Use of nurse services in working with claimants, physicians, and employing agencies.
3. Early identification of cases where medical treatment and continued disability appear excessive based upon the nature of the injury and objective medical findings as reported by the treating physician.
4. Prompt referral for vocational rehabilitation services when partial disability has been established. (ICF Consulting, 2004, p. 19)
5. The use of a guideline matrix that sets intervention points; it uses generally accepted disability periods for common injuries and conditions as determined by the American Medical Association (ICF Consulting, 2004).

The optimum time for case management intervention is the date of injury or as soon as possible thereafter. In order to be successful in case management, it is critical to establish expectations about returning to work from the first day of injury. However, QCM does not engage in case management until the employee files a claim for compensation beyond the 45-day period for COP. To address this issue, the OWCP established the Continuation of Pay Nurse Intervention Program. These nurses, referred to as early nurses, are contracted telephonic case managers that liaison between the injured employee, the employing agency, and the treating physician in order to ensure that a return-to-work date had been established. Problem cases are forwarded to the QCM program. Unfortunately, one notable weakness continues to hinder the goal of early intervention. Namely, due to COP benefits that are paid by the local employing agency, it can be up to 40 days post-injury before the OWCP learns about an injured employee that could benefit from an early nurse or QCM (ICF Consulting, 2004).

The DOD has demonstrated some success in FECA cost containment. The DOD paid over \$627 million in FECA costs in fiscal year 2003, a 1.3% increase over the previous fiscal year. By contrast, non-DOD FECA costs increased 6.0% to a total of \$2.323 billion. From 1994 to 2003, DOD FECA costs have increased only 4.0% compared to 26.6% for the entire Federal government. In addition, increases in DOD FECA costs have been below the consumer price index for each year during this timeframe. Using the entire Federal government as a benchmark, the efforts put forth by the DOD in FECA cost containment have resulted in a \$136 million cost avoidance over nine years. Despite these encouraging statistics, however, one should take note that even though less than 25% of DOD FECA costs are for the medical treatment of injured workers, 60% of DOD's increase in fiscal year 2003 was attributable to medical costs (Scanlon, 2003).

The DOD uses case management as the cornerstone for cost containment. Case management has focused upon utilization of medical services, bill audits, modified duty assignments for injured workers, detection of fraud, communication among the relevant players, and the management of the injured worker's expectations. At the installation level, case management is a team effort among the worker's supervisor, the injury compensation program administrator in the personnel office, a case manager (usually hired by the personnel office), and the occupational medicine physician. Conceptually, the injured worker is also part of the case management team since the expectations of the worker need to be managed early with consistent messages to achieve a desired level of commitment to becoming well. The worker's supervisor is especially critical for determining alternative work assignments for the injured worker in order to decrease lost workdays and regain productivity. Finally, the treating physician is considered a member of the case management team; however, as previously noted, regulatory barriers exist

that severely limit direct communication between government representatives and the treating physician.

Variation in Practice Theory

Quality is considered to be inversely proportional to variation in health care services. Although not all variation is unwarranted since it can be explained on the basis of medical need, most variation in health care is wasteful and ineffective. As mentioned previously, the IOM has explicitly mentioned the need to decrease unwarranted variation in clinical practice as a means to improve quality in American health care systems: "Care should not vary illogically from clinician to clinician or from place to place" (IOM, 2001). Unwarranted variation is defined as "care that is not consistent with a patient's preference or related to a patient's underlying illness" (Wennberg & Wennberg, 2003). Unwarranted variation can occur within three categories of care: effective care, preference-sensitive care, and supply-sensitive care.

Effective care is care that is evidence-based. When evidence-based care is underused, unwarranted variation occurs, resulting in potentially ineffective care. Studies generally show underuse of effective care in health care systems. Underuse of effective care can be remedied by monitoring the processes of care at the hospital and physician group levels (Wennberg, 2002). This data is then used to drive improvement activities.

Preference-sensitive care requires that patients make choices about their care when multiple valid treatments exist. The patient's choice should determine what is done. When the provider's opinion dominates the patient's preference, unwarranted variation occurs. Preference-sensitive care involves the patient in a meaningful way in the choice of treatment. Unwarranted variation in preference-sensitive care probably indicates misuse of this type of care. The remedy

for unwarranted variation in preference-sensitive care is shared decision-making for treatment options (Wennberg, 2002).

Supply-sensitive care is care that is not supported by scientific evidence. This category of care is correlated with the capacity of the health care system, such as the number of hospital beds or the availability of specialists. Health outcomes of people living in areas of high supply-sensitive care are no better than those for people who live in areas with lower rates of these services. There appears to be widespread overuse of supply-sensitive care. High use of supply-sensitive care is wasteful of resources that should be reallocated to appropriate priorities. Management of the health system's capacity and the promotion of conservative practice styles, particularly for end-of-life care, is the remedy for the overuse of supply-sensitive care (Center for the Evaluative Clinical Sciences, 2000).

Each type of unwarranted variation may exist within the FECA context. No scientifically established evidence exists to guide the medical management of FECA beneficiaries and thus there is no current basis upon which to decide which care is unwarranted on an evidence basis. It is also likely that unwarranted variation in supply-sensitive care exists, depending upon the availability of health care providers that may cater to FECA beneficiaries.

Purpose of the Project

The purpose of this project is the establishment of an evidence base for the medical management of injured civilian federal employees. If management techniques show evidence of improved outcomes, then reduction in variation of structure and process in the medical management of injured civilian federal employees can be sought. Consequently, variation in outcome measures should be reduced.

Methods and Procedures

The DOD Civilian Personnel Management Service, Injury and Unemployment Compensation (ICUC) Division's Defense Portal Analysis Center (DefPAC) includes a database of information obtained from the various claims forms that are submitted during the injury compensation process (Figures 1 and 2). In addition, the DefPAC database contains charge-back data, i.e., the amount that is charged from the DOL to the DOD for wage loss compensation and medical cost compensation for injured DOD civilian employees. Specifically, the database contains charge-back amounts to the major command level of DOD, with attribution to the unit of origin by way of unit identification codes (UIC). Data are available in the database by UIC; data at the individual case level are not available. The variables contained within the DefPAC database include DOD component, charge-back year, injury year, UIC, occupation codes, claimant age, nature of injury, causes of injury, extent of injury, and anatomical location of injury. DefPAC charge-back measures include total cost, medical costs, compensation costs, count of cases paid, average medical cost per case, average compensation cost per case, and average total cost per case. For this study, the dependent variable is derived from the DefPAC database. Specifically, the dependent variable is the average total cost per case for each Army medical treatment facility (MTF).

Standardized code sets for the DefPAC database are the foundation for reliability of the data. The charge-back reports issued from the DOL to the DOD serve as a validation document. The unit of origin for the injury reviews the data in the report to confirm its accuracy. The validity of the DefPAC data relies upon this local-level validation step. Due to the standardized code sets and the local-level validation of data, the database appears to be sufficiently reliable and valid for further analysis.

The independent variables are derived from the annual Occupational Health Program Status Report (OHPSR), administered for the second time by the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) in late-2004. Twenty-eight questions from the Occupational Health Program Status Report, representing 83 possible independent variables, pertain to the medical management of injured civilian employees in Army occupational health clinics (see Appendix). Standardized responses to the OHPSR questionnaire are the basis for reliability of the data. With regard to the data's validity, the commanders that oversee each of the occupational health clinics attest to the validity of the responses. Additionally, experienced occupational health nurses at the CHPPM, that are familiar with each clinic, review the submitted data for a second validity check.

Inclusion criteria for MTFs are the following: (a) Based in the continental United States (CONUS); (b) designated by a UIC that is not a derivative UIC, that is, the six-character UIC must end in *AA*; (c) data must be available for the dependent variable; and (d) must have been a respondent to the OHPSR. Using only those MTFs that are CONUS-based allows for better comparison between the MTFs since the workers do not include local nationals, as commonly seen at overseas MTFs. In this way, all of the civilian employees in the study are subject to the provisions of FECA, rather than the laws of the host nation. Including MTFs with UICs ending in *AA* ensures that the size of the MTF is larger than merely a primary care clinic, where one FECA case could skew the data derived from one injury year of experience. Applying these exclusion criteria, 22 MTFs are available for analysis.

The dependent variable, derived from DefPAC data, is defined as the average total cost (includes wage-loss compensation and medical costs) per case in which the injury occurred in fiscal year (FY) 2003 (October 1, 2002 through September 30, 2003). Specifically, then, the

dependent variable is the average total cost per case paid through charge-back mechanisms from FY2003 through the 2nd quarter of FY2005 for each of 22 MTFs for injuries that occurred in FY2003. The independent variables are defined by the questions posed to the responding MTFs in the OHPSR (see appendix).

SPSS 12.0.2 for Windows is used as the statistical software to calculate descriptive statistics and inferential statistics, namely multiple linear regression. The hierarchical multiple linear regression described below is done by hand using a calculator, known formulae for calculation of the degrees of freedom and the *F*-statistic, and tables of *F*-statistics for three levels of statistical significance ($p = .05$, $p = .01$, and $p = .001$).

A correlation matrix is developed for the average total cost per case, the average wage-loss compensation per case, the average medical cost per case, and all 83 potential independent variables. Independent variables are then included for further model development by meeting two-tailed statistical significance for the Pearson correlation coefficient at an alpha level of less than 0.10 between the independent variable and either the average total cost per case, the average wage-loss compensation per case, or the average medical cost per case. This serves to narrow down the number of independent variables to those which may ultimately contribute to the final model in a statistically significant manner. Based upon this inclusion criterion, the following independent variables are included for further analysis:

X_1 = frequency of FECA committee meetings (number per year)

X_2 = Resource Management Division maintaining proponency for the local FECA program (binary variable: yes or no)

X_3 = Occupational Health (OH) physician being a member of the FECA committee (binary variable: yes or no)

X_4 = Evaluation of questionable FECA claims by an OH professional (binary variable: yes or no)

X_5 = Review and reaction to documentation from outside health care providers by an OH professional (binary variable: yes or no)

X_6 = OH professional communication with outside treating physicians to coordinate return to work of the injured employee (binary variable: yes or no)

X_7 = presence of a full-time injury compensation program administrator (ICPA) (binary variable: yes or no)

Multiple linear regression, with pairwise exclusion for missing data, is initially used to develop a full model that incorporates all seven of the independent variables identified above as potential predictors of change in the dependent variable. Hierarchical multiple linear regression is then used as described previously by other authors (Brooke, Hudak, & Finstuen, 1994). Specifically, hierarchical analysis is used to quantify and test hypotheses that each independent variable in the model makes a unique contribution to explaining the variance observed in total average cost per case across MTFs. The hierarchical analysis begins with the R^2 associated with the full model. The full model's R^2 is compared with each R^2 that is associated with seven reduced models (i.e., models in which only one of the independent variables is omitted). Comparing the R^2 of the full model with the R^2 of each reduced model allows for a clear quantification of the variance in the dependent variable that is uniquely attributable to the independent variable that was removed in each reduced model.

Subsequent to this initial analysis, the independent variable with the least statistically significant unique contribution to explaining variance in the dependent variable is removed from the model. Hierarchical multiple linear regression analysis is repeated, this time only with the

surviving six variables. Again, the independent variable with the least statistically significant unique contribution to explaining variance in the dependent variable is removed from the model. This process is repeated until the model contains only those independent variables that uniquely explain variance in the dependent variable in a statistically significant manner.

Results

Figure 3 shows variation in the dependent variable across the 22 MTFs. The average total cost per case varies from less than \$1,000 to more than \$20,000. Descriptive statistics for the 22 MTFs that met the inclusion criteria are shown in Table 3. The mean of the average total cost per case is \$2,350.

After pairwise exclusion for missing data, 13 MTFs remain for inferential analysis. Inferential statistics derived from hierarchical multiple linear regression are shown in Tables 4 and 5. The initial full model (Table 4), which includes all seven independent variables, accounts for 87% of the variance observed in the dependent variable in a statistically significant manner ($R^2 = .868$). Hierarchical multiple linear regression analysis reveals changes in R^2 when individual independent variables are removed from the full model one at a time. The change in R^2 between the full model and each reduced model indicates the amount of variance in the dependent variable that is uniquely attributable to the variable removed from the full model. Table 4 shows that the independent variable with the least unique contribution to the full model's R^2 is X_6 (OH professional communication with outside treating physicians to coordinate return to work of the injured employee). Thus, X_6 was removed from the model. Subsequent iterations of hierarchical multiple linear regression removed the following independent variables from the model, in this order: X_7 (presence of a full-time injury compensation program administrator),

X_2 (resource management division maintaining proponency for the local FECA program), and X_4 (evaluation of questionable FECA claims by an OH professional).

Table 5 shows the final model with the three surviving independent variables. These three variables collectively account for 79.2% of the variance in the dependent variable. Each independent variable uniquely contributes to the full model R^2 in a statistically significant manner. X_1 (frequency of FECA committee meetings) uniquely explains over half of the variance in the total average cost per case. Likewise, X_3 (OH physician being a member of the FECA committee) and X_5 (review and reaction to documentation from outside health care providers by an OH professional) each uniquely account for about one-quarter of the variance seen in total cost per case.

The final model is highly significant, statistically speaking. The predictive equation for the final model is:

$$Y = -10,913 + 882X_1 - 4,409X_3 + 10,833X_5$$

where Y = average total cost per case (in dollars); X_1 = frequency of FECA committee meetings (number per year); X_3 = OH physician being a member of the FECA committee (yes = 1, no = 0); and, X_5 = review and reaction to documentation from outside health care providers by an OH professional (yes = 1, no = 0).

Conclusions and Discussion

Three structure and process variables used in the medical management of injured civilian federal employees are significantly related to the outcome of average total cost per case. The strongest predictor of average total cost per case for employees injured in FY2003 is the frequency at which the FECA committee meets. However, the result shown in the analysis is somewhat counterintuitive. In the absence of data, one could logically conclude that a

committee that meets more often would be more effective. But this study does not support this supposition. Rather, the predictive equation above reveals that the average total cost per case is higher when the FECA committee meets more frequently. Since it is unlikely that an active FECA committee actually contributes to a higher cost per case (the cost of the committee itself is not included in charge-back data and thus is not included in this study), a plausible explanation is that those MTFs that have been struggling with high FECA costs have made the management decision to convene the committee more often. This decision may have been implemented after FY2003, making the effectiveness of the committee not reflected in this study.

The argument above is a reflection of a substantial weakness of cross-sectional studies. Cross-sectional studies lack a temporal predictive quality. The charge-back data reflects a subset of injuries that have occurred within only one year. Likewise, the OHPSR data represents structure and processes that are in place at one moment in time. Since this study is not longitudinal in nature, it is impossible to firmly conclude whether the frequency of FECA committee meetings resulted in higher costs, or whether the higher costs resulted in the management decision to increase the frequency of FECA committee meetings. Intuitively, the latter situation is the more plausible interpretation.

Similarly, the predictive equation shows that review and reaction to documentation from outside health care providers by an OH professional is directly proportional to the average total cost per case. Again, this seems counterintuitive. One would suspect that active review and reaction to the care being provided to injured employees by outside health care providers would result in cost containment through case management. Once again, the weakness of cross-sectional studies to conclude temporal relationships is reflective here. The management process

of reviewing such documentation may have been implemented in response to unacceptably high FECA costs.

The predictive equation also reveals that the presence of an OH physician on the FECA committee is inversely proportional to average total cost per case. Specifically, the presence of an OH physician on the FECA committee is associated with a \$4,409 reduction in total cost per case over those MTFs that do not have an OH physician on the committee. The six MTFs with FECA committees without an OH physician as a member represent 182 cases as a result of injury in FY2003 (data not shown). According to the predictive equation, MEDCOM can realize \$802,438 ($108 \times \$4,409 = \$802,438$) in reduced charge-back costs by including an OH physician on the existing FECA committees of the six MTFs that currently do not include an OH physician. Despite the pitfalls of interpretation of cross-sectional studies, it is logical to conclude that the presence of the OH physician on the committee is temporally associated with reduced charge-back costs since OH physicians are specifically trained in the medical management of workers' compensation cases.

It should be noted that the existence of a FECA committee itself was not a predictor of average total cost per case. However, of those MTFs with FECA committees, those with OH physicians as members showed a statistically significant reduction in average total cost per case. In this study, seven MTFs do not have a FECA committee.

These data should be interpreted with caution when attempting to attribute failure of cost-containment to specific MTFs. These data represent only one year of injuries (i.e., FY2003). Injury rates can vary from year-to-year at individual MTFs. Also, the outcome data have not been adjusted for age of the claimant, injury type, or job classification. Each of these considerations could affect the total cost of each case. One year of an undesirable injury rate that

affected older employees in higher paying positions could skew the data for a particular MTF. Interpreting the data on the basis of the entire MEDCOM may serve to diminish the effects of these confounders.

The magnitude of the average cost per injury should also be viewed cautiously. The data presented here represent only one-two years of wage-loss and medical costs. The mean of the average total cost per case is \$2,350. But this figure is low since it represents only those injuries that occurred in 2003, some of which may not have been claimed yet. Additionally, some cases remain open for many more years, causing agencies to pay the costs for many years into the future.

COP also contributes to the cost of an injured employee. However, COP is paid by the employing agency; thus, it is never shows up in the DefPAC database. It is likely that a substantial cost is devoted to COP and is not reflected in this study.

Caution is also advised when attributing potential changes in outcome to specific variables. Variables that have not been included in this study for study-design reasons may have a substantial impact on predicting variance in the dependent variable. Omitted variables can also cause the variance that is uniquely attributable to one of the study variables to be overestimated.

Due to a limited sample size, statistically significant associations of smaller strength than those identified in this study are possible, perhaps even likely. The use of variables that were not applicable to all MTFs contributed to the sample size problem. For example, only 15 MTFs had FECA committees. Therefore, only 15 MTFs, rather than the 22 MTFs included in the study, were suitable for inferential statistical analysis of the presence of an OH physician as a member of the committee. Additionally, due to missing data from lack of responses to select questions in the OHPSR, pairwise exclusion to account for the missing variables resulted in only 13 MTFs

being included in the linear regression analyses. Therefore, sample size deficiency could be partially corrected by ensuring that OHPSR respondents answer all questions posed in the questionnaire.

To overcome some of the limitations of this study, further research is recommended that uses primary data at the individual case level, rather than aggregated data as used in this study. Such data can be adjusted for age and other potential confounders. Until superceded by studies that overcome the present study limitations, this study can be used as an evidence base for effective medical management of injured civilian federal employees. This evidence base can be used for policy development aimed at the reduction of variation in the management of these cases.

In summary, this study reveals the wide variation that exists in the structure and processes used in the medical management of injured civilian federal employees. Likewise, there is wide variation in the outcome of average total cost per case across the MTFs. One statistically significant predictor of the average total cost per case at any given MTF is whether an OH physician is a member of the local FECA committee. From a MEDCOM-wide perspective, having an OH physician on the FECA committee may result in a \$4,409 reduction in average total cost per case. In FY2003, 182 cases could have benefited from a management decision to include an OH physician on the FECA committee where the committee did not previously have one as a member. Accordingly, MEDCOM could have realized over \$800,000 in FECA cost reduction for FY2003 alone by implementing a policy requiring the inclusion of an OH physician on their local FECA committees. This study supports such a policy as a best practice in the medical management of injured civilian employees. In other words, a FECA committee without an OH physician as a member could be considered as an unwarranted

variation in practice. Reducing this unwarranted variation would likely reduce charge-back costs to MEDCOM and reduce the variation in cost currently observed.

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Table 1

Traumatic Lost-Time Injury Claims under the Federal Employees' Compensation Act

Fiscal Year	Number of Claims
1970	17,000
1971	14,000
1972	12,000
1973	16,000
1974	12,000
1975	37,000
1976	80,000
1977	92,000
1978	94,000
1979	101,000

Note. Adapted from Nordlund, 1991

Table 2

<i>Selected Features of the Federal Employees' Compensation Act</i>	
Feature	Description
Free choice of physician ^a	Injured employees are free to choose their treating physician.
Referrals to other physicians	The original referring physician may refer the employee for additional testing or specialized treatment without pre-authorization.
No direct contact with physician	The employer (including medical personnel employed by the employer) may not contact the treating physician by telephone or through personal visit. All such communication must be in writing. ^b
No "clinic-first" policies	Agency personnel may not interfere with the employee's right to choose a physician, nor may they require an employee to go to a physician who is employed by or under contract to the agency before going to the physician of the employee's choice.
Continuation of pay (COP)	An employee's regular pay may continue for up to 45 calendar days of wage loss due to injury. The intent of this provision is to avoid interruption of the employee's income while the case is being adjudicated. COP is not considered compensation and is therefore subject to taxation. After entitlement to COP ends, the employee may apply for compensation or use leave.

Fee schedule	No limit is imposed on the amount of medical expenses or the length of time for which they are paid, as long as the charges represent the reasonable and customary fees for the services involved and the need for treatment can be shown.
Exclusion of Providers	Employees may not choose treatment from a physician whose license to practice has been suspended or revoked or has been excluded from payment under the FECA (usually for fraud conviction, FECA violations, substandard care, or ethical concerns).
Administered by DOL	DOL is responsible for adjudicating claims and making payments to the billing physician and compensation to the employee.
Charge-back system	This is the mechanism by which the annual costs of compensation for work-related injuries are assigned to the employing agencies. The agencies include these amounts in their budget requests to Congress. The sums appropriated or obtained from operating revenues are deposited in the Employees' Compensation Fund.

Note. Source is United States Department of Labor, 1999. DOL = Department of Labor

^aThe term "physician" includes surgeons, osteopathic practitioners, podiatrists, dentists, clinical psychologists, optometrists, and chiropractors within the scope of their practice as defined by State law and FECA. ^bSource is Title 20, Code of Federal Regulations, Part 10, 1999.

Table 3

Descriptive Statistics

Variable	<i>n</i>	%	<i>M</i>	<i>SD</i>	<i>r</i>
Cost per Case			\$2,350	\$4,435	
FECA Committee Meetings (per year) ^a			7.2	6.0	.657 ^b
Resource Management Maintaining FECA Program Proponency	1	5			.153 ^c
OH Physician on FECA Committee ^d	9	60			-.442
OH Evaluation of Questionable Claims ^e	15	88			-.417 ^f
OH Review and Reaction to Documentation from Outside Providers ^e	15	88			-.270 ^f
OH Communication with Outside Treating Physicians to Coordinate Return to Work ^e	15	88			-.347 ^f
Full-Time Injury Compensation Program Administrator ^g	11	50			.421

Note. *n* = 22 MTFs unless otherwise noted. FECA = Federal Employees' Compensation Act, OH = occupational health professional, MTF = medical treatment facility

^aOnly 15 of the 22 MTFs have FECA Committees. ^b*p* = .008. ^cVariable included due to correlation with average medical cost per case (*p* < 0.1). ^d*n* = 15 MTFs. ^e*n* = 17 MTFs. ^fVariable included due to correlation with average compensation cost per case (*p* < 0.1). ^g*n* = 20 MTFs.

Table 4

*Hypothesis Tests of Effects on Dependent Variable
Uniquely Attributable to Seven Initially-Chosen Independent Variables*

Effect Tested	R ² Full Model	R ² Reduced	Variance Uniquely Explained	df1	df2	F	p
Full 7-Variable Model	.868	-	.868	7	6	5.64	<.05
FECA Committee Meetings (per year)	.868	.449	.419	1	6	19.05	<.01
Resource Management Maintaining FECA Program Propensity	.868	.823	.045	1	6	2.05	NS
OH Physician on FECA Committee	.868	.791	.077	1	6	3.50	NS
OH Evaluation of Questionable Claims	.868	.809	.059	1	6	2.68	NS
OH Review and Reaction to Documentation from Outside Providers	.868	.569	.299	1	6	13.59	<.05
OH Communication with Outside Treating Physicians to Coordinate Return to Work	.868	.868	0	1	6	-	NS
Full-Time ICPA	.868	.866	.002	1	6	0.09	NS

Note. n = 13 medical treatment facilities. FECA = Federal Employees' Compensation Act. OH = occupational health professional. ICPA = Injury Compensation Program Administrator. NS = not statistically significant at p = .05

Table 5

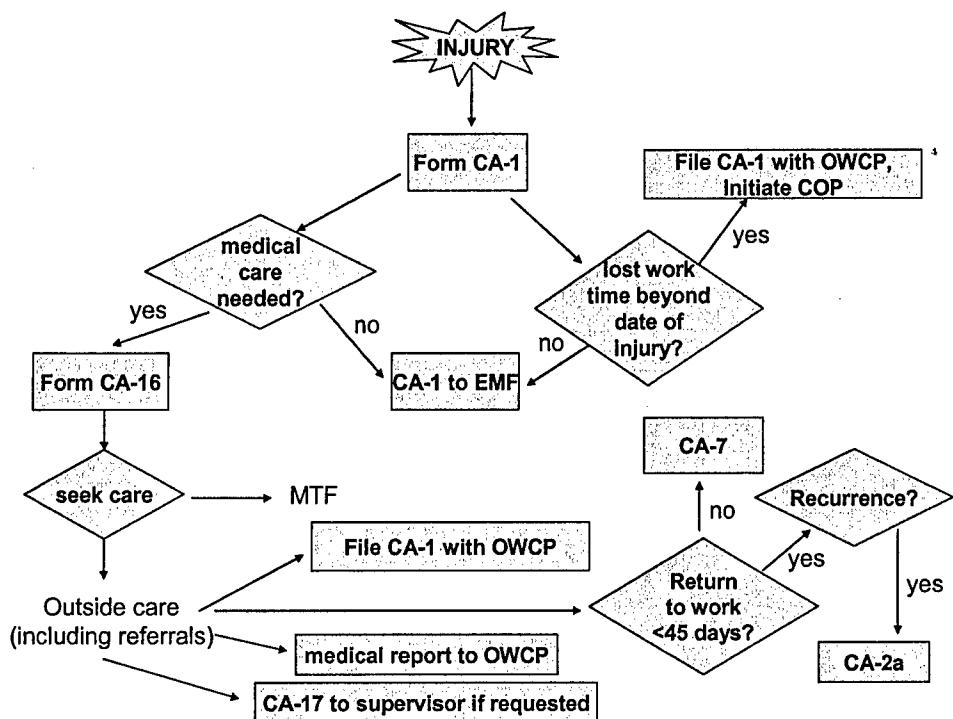
*Hypothesis Tests of Effects on Dependent Variable
Uniquely Attributable to Three Independent Variables of the Final Model*

Effect Tested	R^2 Full Model	R^2 Reduced	Variance	$df1$	$df2$	F	p
			Uniquely Explained				
Full 3-Variable Final Model	.792	-	.792	3	10	12.69	<.001
FECA Committee Meetings (per year)	.792	.214	.578	1	10	27.79	<.001
OH Physician on FECA Committee	.792	.567	.225	1	10	10.82	<.01
OH Review and Reaction to Documentation from Outside Providers	.792	.548	.244	1	10	11.73	<.01

Note. $n = 13$ medical treatment facilities. FECA = Federal Employees' Compensation Act. OH = occupational

health professional.

Figure 1. Flowchart for injury management at the local level.



COP = continuation of pay

EMF = employee medical file

Form CA-1 = Federal Employee's Notice of Traumatic Injury and Claim for Continuation of Pay/Compensation

Form CA-2a = Notice of Employee's Recurrence of Disability and Claim for Pay/Compensation

Form CA-7 = Claim for Compensation on Account of Traumatic Injury or Occupational Disease

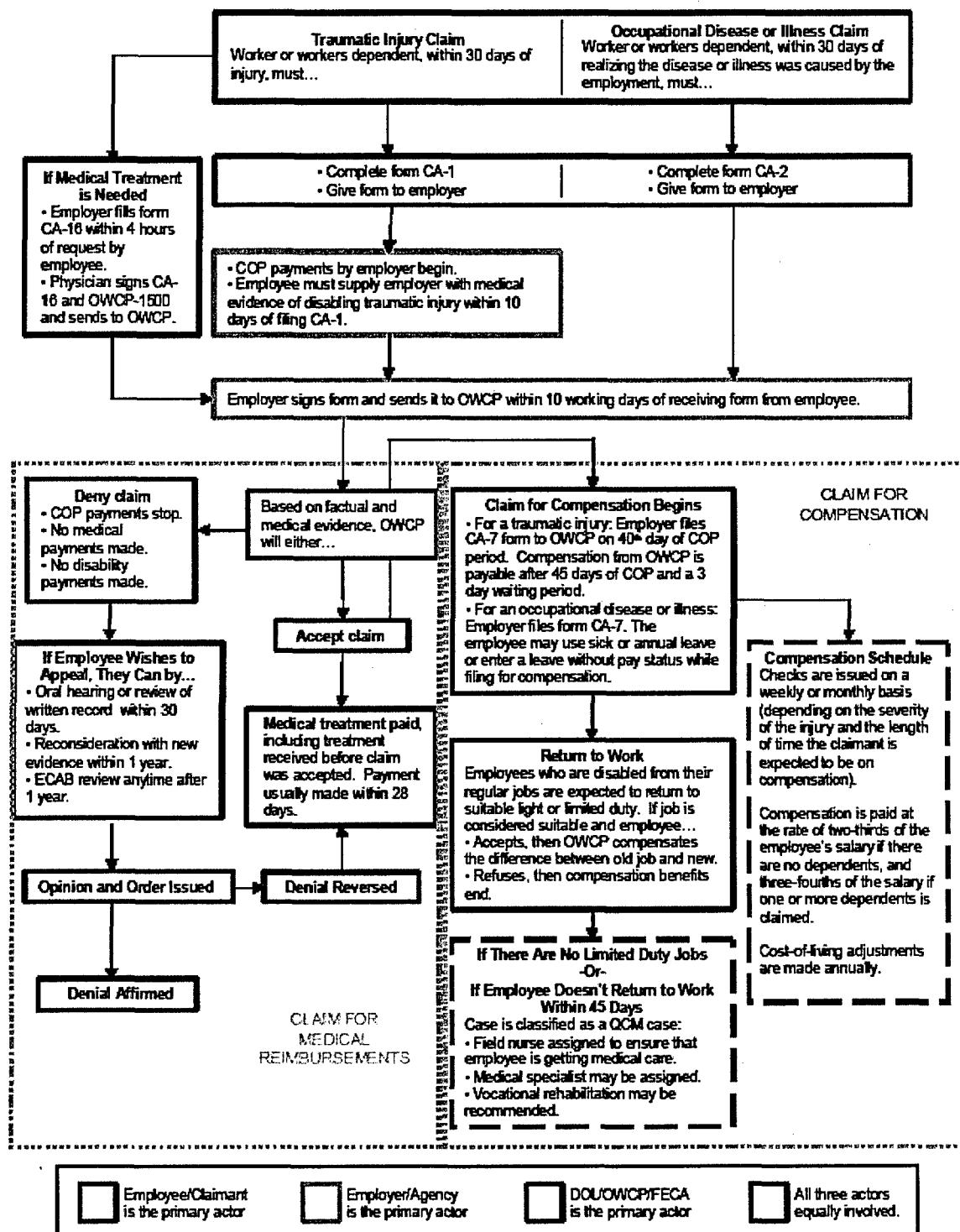
Form CA-16 = Authorization for Examination and/or Treatment

Form CA-17 = Duty Status Report

MTF = local federal medical treatment facility

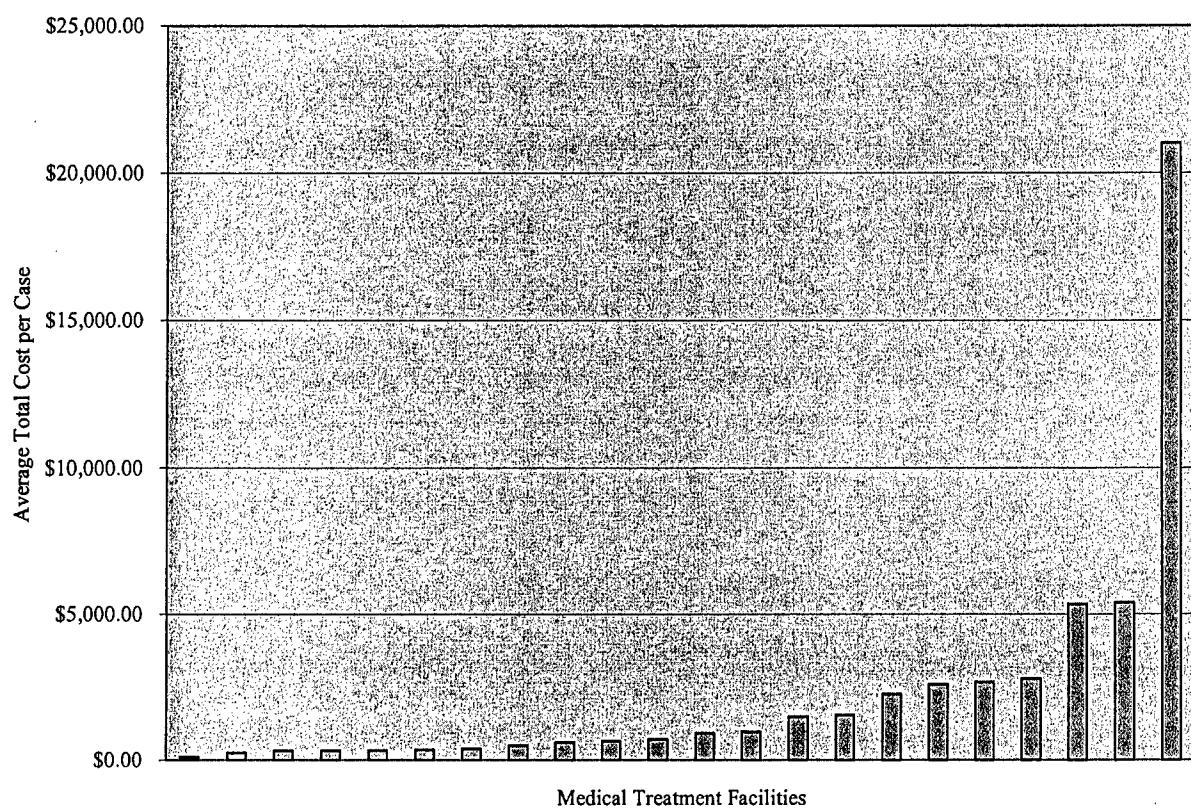
OWCP = Office of Workers' Compensation Program, Department of Labor

Figure 2. Wage loss compensation process.



Note. Source is ICF Consulting, 2004.

Figure 3. Variation in average total cost per case.



Appendix: 2004 Occupational Health Program Status Report (FECA-Related Questions)

1. Does your OH clinic provide occupational injury care or management beyond initial care?
If YES, does the OH clinic provide:

- Offer of ongoing treatment for occupational injury/illness?
- Routine follow-up with injured employees (even if treated by outside provider)?
- Evaluation of employees with questionable claims ?
- Active review and reaction to documentation received from outside provider?
- Preparation of written reports for OWCP?
- Communication with outside treating physicians to coordinate RTW?

2. Is the OH Clinic organized in such a way that prompt care can be expected by an employee arriving for treatment of an occupational injury/illness?

3. How often do employees with an occupational injury or illness report to OH before going to a private resource for treatment?

- Always
- Usually
- Sometimes
- Rarely
- Never

4. Does the OH Clinic also provide primary care services?

5. Is an entry made on the SF 600 by the OH provider each time an employee is treated for an injury or illness?

- Always
- Usually
- Sometimes
- Rarely
- Never

6. Does the OH Clinic receive copies of FECA claim forms (CA-1, CA-2, CA 16)?

- Always
- Usually
- Sometimes
- Rarely
- Never

7. Are all recordable injuries/ illnesses and fatalities reported on the OSHA log?

- Always
- Usually
- Sometimes
- Rarely
- Never

8. Who maintains the OSHA log for injuries and illnesses?

Garrison or Installation Safety Office

MTF Safety Office

CPO

IH

OHN

Other: list

9. Is there a clinical person assigned to case management?

If YES, does this case manager:

Meet with newly injured workers to orient them to the compensation system?

Act as on-site liaison with treating provider to facilitate RTW plans?

Contact DOL claims examiner as needed to request 2nd opinion exams, etc.?

Regularly review or act on old claims?

Perform this function full-time?

10. Does the installation have a FECA committee?

If YES, How often does this committee meet?

Never

Bi-weekly

Monthly

Quarterly

Semi-annually

Annually

11. Which of the following departments are represented on the FECA committee?

Command

Safety

Civilian Personnel Office

OH Physician

OH Nurse

IH

Risk Management

Directors

Others (Specify:)

12. Which of the following activities does the committee perform? (Select all that apply)

Review new claims of occupational injury

Review new claims of occupational illness

Review status of lost time cases

Review status of cases on restricted duty

Review cases on long term disability rolls

Request work area hazard/ergonomics evaluations

Review injury and illness trends

Develop policies related to injury/illness prevention or management

Identify needed preventive measures

Establish goals and benchmarks

13. Are there action items for follow-up at subsequent meetings?
14. Are you able to discuss problems freely?
15. Does the committee prepare a regular report to the command?
If YES, does this report include data trends?
16. Does the installation have a case management team with OH, IH Personnel and Safety as members?
IF YES, How often does this team meet?
 - Never
 - Bi-weekly
 - Monthly
 - Quarterly
 - Semi-annually
 - Annually
17. Who is a member of the case management team? (Select all that apply)
 - ICPA
 - OH Physician
 - OH Nurse
 - CPAC Chief
 - Others (Specify):
18. Which of the following activities does the case management team perform? (Select all that apply)
 - Review new claims of occupational injury
 - Review new claims of occupational illness
 - Review status of lost time cases
 - Review status of cases on restricted duty
 - Review cases on long term disability rolls
 - Request work area hazard/ergonomics evaluations
 - Propose personnel actions (modified job offers, separations, etc.)
19. Does the installation have specific written policies on the following? (Select all that apply)
 - Accident/injury reporting
 - Claims submission
 - Management of Injured Workers
 - Return to Work policy
 - Light/modification duty
20. If there are written policies, are supervisors and managers trained in implementing them?

21. Is there a system that requires someone from the installation to have regular contact with the injured worker?

22. Do frontline supervisors actively work to get injured employees back to work?

- Never
- Bi-weekly
- Monthly
- Quarterly
- Semi-annually
- Annually

23. Does your installation Injury Compensation Program Administrator (ICPA) perform this duty full-time?

IF NO, approximately how many hours per week does the ICPA spend on FECA?

- 1-5 hours
- 6-10 hours
- 11-15 hours
- 16-20 hours
- >21 hours

24. Does the FECA clerk have regular contact with the Department of Defense (DOD) Liaison?

- Never
- Bi-weekly
- Monthly
- Quarterly
- Semi-annually
- Annually

25. Does the installation FECA clerk make periodic visits to Department of Labor (DOL)?

- Never
- Bi-weekly
- Monthly
- Quarterly
- Semi-annually
- Annually

26. Who maintains proponency for the FECA Program? (Select one)

- CPAC
- SAFETY
- OH
- COMMAND
- Other: List

27. Does the installation accommodate temporary restricted/light/modified duty?

28. Does the installation offer modified duty or other permanent alternative positions for injured employees with permanent restrictions?